

varieties are crossed, the character of one of the parents is commonly alone visible, but the (different) character of the other is really present, though latent, in the offspring. On again crossing the latter these latent characters reappear, and often in a very definite proportion, in this second generation.

This fact was discovered many years ago by Mendel, and has formed the basis of most of the recent experimental work that has thrown so much light on the problems of heredity. But although it harmonises, in a large number of cases, with the expectation based on a study of nuclear division, there are many things which still require explanation. Prof. Strasburger has touched on some of these; thus, for instance, the proportion of the sexes in many unisexual plants and animals is an almost invariable one, and appears to be inexplicable on the view of the chromosomes above indicated. On the other hand, we know, especially amongst animals, of cases in which the sex of the offspring can be definitely affected by conditions that are under control, although further study is necessary for their thorough elucidation. The assumption of entirely new characters again provides a field of research that as yet can hardly be said to have been explored at all except statistically, and it is at the same time one that is certain to yield most profitable fruit.

These and many other points are raised in the pages of a booklet which, while of small dimensions, is replete with material for thought. Prof. Strasburger has shown that a popular exposition does not necessarily connote a superficial treatment of a difficult subject.

J. B. F.

DISEASE AND ITS PREVENTION.

- (1) *Immunity in Infective Diseases*. By Prof. Élie Metchnikoff. Translated from the French by Francis G. Binnie. Pp. xvi+591. (Cambridge: University Press, 1905.) Price 18s. net.
- (2) *The Inflammation Idea in General Pathology*. By Dr. W. H. Ransom, F.R.S. Pp. vi+354. (London: Williams and Norgate, 1905.) Price 7s. 6d.
- (3) *The Milroy Lectures on Epidemic Disease in England. The Evidence of Variability and of Persistency of Type*. By Dr. W. H. Hamer. Pp. 72. (London: Printed at the Bedford Press, 20 and 21 Bedfordbury, W.C., 1906.)
- (4) *Microbiologie Agricole*. By Dr. Edmond Kayser. Pp. xii+439. (Paris: Librairie J. B. Baillière et Fils.) Price 5 francs.

(1) **P**ATHOLOGISTS will welcome this translation of Prof. Metchnikoff's great work on immunity, containing as it does the results of twenty years' work devoted to the subject. Commencing with some introductory remarks on the importance of immunity, the author passes on to review the phenomena of immunity in unicellular animals and in multicellular plants, the resorption of formed elements and of albumenoid fluids in animals, instances and mechanism of natural immunity against micro-organisms, the problems of acquired immunity against

micro-organisms and of natural and artificial immunity against toxins, and the comparative immunity of the skin and mucous membranes to microbial attacks. A chapter on protective vaccinations, and another giving a useful summary of the whole subject and an historical sketch of our knowledge of immunity conclude the volume.

The dominant idea running through the whole book, and supported with the greatest ability and ingenuity, is that the means of defence of the organism against the invasion of micro-organisms lie principally, if not entirely, with certain of the wandering cells of the body, "phagocytes," which comprise some of the leucocytes, and probably also certain endothelial and fixed connective tissue cells. These phagocytes either directly attack the invaders, enveloping and digesting them (phagocytosis), or, in the case of toxins, unite with these and prevent their toxic action, or secrete, or produce as a result of their disintegration, substances which are bacteriolytic and bactericidal for micro-organisms, and occasionally antitoxic for toxins. Under natural conditions it is chiefly against the microbes, and not against their toxins, that the organism has to defend itself, and hence phagocytosis normally is all-important. It used to be supposed that the body fluids were bactericidal, and the blood serum *in vitro* frequently possesses marked bactericidal properties, but Metchnikoff and his co-workers, particularly Gengou, have shown that the blood plasma in such cases before coagulation has occurred is almost devoid of bactericidal power, but after coagulation the breaking down of leucocytes which accompanies this phenomenon apparently gives rise to the bactericidal substances in the serum.

There is little to criticise in the book. It is somewhat difficult to grasp exactly what cells Prof. Metchnikoff regards as phagocytic, as his nomenclature of the leucocytes differs essentially from that used by most pathologists. In the chapter on preventive inoculation Haffkine's anti-choleraic inoculation is criticised in a manner hardly justified in view of the excellent results shown by the statistics of Simpson and others. In certain places the statements are not quite up to date, since the book in the original was published in 1901.

The volume is fascinating reading, and anyone who first dips into it will in all probability do more, and study it deeply. It forms a complete statement of the phagocytic hypothesis, and a masterly summary of the whole subject of immunity up to 1902.

(2) It is somewhat difficult to grasp exactly what the author of this book wishes to impart to his reader. Apparently it is his desire to formulate a conception of inflammation which shall be applicable to all organisms, animal and vegetable. The author believes that pathologists have always considered that inflammation is the first stage towards repair after an injury. But this is hardly so; it would be more correct to say that pathologists hold that the phenomena of inflammation *generally tend towards repair*, which is a conception distinctly different from that assumed by Dr. Ransom. According to him, an

injury in any organism is followed by responses misdirected and always damaging; "these misdirected perturbed responses are inflammation." . . . "It is distinguished from repair, for it is a perturbation thereof." This theme is supported by a number of examples, principally derived from injuries, &c., in vegetable organisms.

(3) In these Milroy lectures Dr. Hamer gives a brief but fascinating account of some of the plagues and pestilences that ravaged England and Europe during the early and Middle Ages, and attempts to unravel the nature of some of these. That principally dealt with is the "sweating sickness," a mysterious disease which appeared in England in 1485, and recurred again and again. By careful analysis this disease is proved to be epidemic influenza. A consideration of the records of measles and of small-pox leads to the conclusion that these two diseases have maintained a wonderful fixity of character.

(4) This book should usefully serve the purpose for which it is intended, viz. to give an account of microbial activity in relation to agriculture. The introduction on the morphology and classification of the bacteria is perhaps not altogether satisfactory, but the succeeding portions of the book successfully epitomise the subjects of nitrification and denitrification, the fixation of atmospheric nitrogen by the agency of various micro-organisms, and the various industries dependent on microbial activity. Under the last heading the alcoholic, acetic, and lactic fermentations are dealt with at length, also bread and sugar making, ensilage, flax and tobacco manufacture, and tanning. The book thus gives a very complete account of fermentation processes, is illustrated with a number of figures, and can be cordially recommended.

R. T. HEWLETT.

CAPTAINS OF CHEMICAL INDUSTRY.

Some Founders of the Chemical Industry: Men to be remembered. By T. Fenwick Allen. Pp. xxiii + 289. (Manchester and London: Sherratt and Hughes, 1906.) Price 5s. net.

THIS book consists of a series of biographical sketches of men whose claim to remembrance is mainly based on their connection with the development of the great chemical industry of Lancashire and the North, viz., the manufacture of alkali and of the other chemical products which are directly associated with that industry. These sketches originally appeared in the *Chemical Trade Journal*, and Mr. Allen has done wisely in putting them together and republishing them in book-form, and thereby rendering them more readily accessible to all who are interested in the personal history of technology.

The book deserves to be in the library of every polytechnic and technical school in the country. Although it deals with only a special branch of chemical industry, that branch, in point of magnitude and commercial value, is by far the most important of our chemical manufactures. The story of its rise and progress, as illustrated by the biographies of its founders, is one of the most interesting and fascinating chapters in the history of industry in

this country. Dr. Smiles has done much by biographical narrative to popularise what may be called the romance of industry, and it cannot be doubted that his works have served to fire the ambitions and to stimulate the endeavours of hundreds of earnest, thoughtful young men. But the life-history of his heroes, and the story of their struggles, their disappointments and successes, is not a whit more marvellous or more enthralling than the stories of such men as Gossage, Gamble, Muspratt, Andreas Kurtz, or Henry Deacon. No chemical technologist—be he young or old—can rise from the perusal of even the most meagre account of their life-work without realising that genius in chemistry is to be found as much in its applications to the material benefit of mankind as in the elucidation of its scientific truths.

The men who collectively founded and developed in this country the several manufactures which are comprehended under what is known as the alkali trade sprang, for the most part, from the lower middle class. They were persons of very small means, imperfectly educated, and with very little knowledge, to begin with, of chemistry. It is difficult, indeed, in some cases to discover why they should have turned their attention to chemical pursuits. Gossage was born in a small Lincolnshire town; Gamble was an ordained minister of the Presbyterian kirk in Enniskillen; Muspratt was also an Irishman—a rolling stone, who tried the army and then the navy, before he settled down to chemical manufacture; Deacon was a Londoner, and apprenticed to an engineering firm; Allhusen started life in the grain trade; and Peter Spence's father was a hand-loom weaver in Brechin, who apprenticed him to a grocer. Not one of them was predisposed by the circumstances of his origin or home-life to take up chemistry, of which science, indeed, he could have no knowledge until long after the age at which most young men nowadays begin their life-work. Deacon's bent may possibly have been determined by his association, as a boy, with Faraday, but it is more than likely that it was the failure of the engineering firm to which he was apprenticed that changed the current of his life and made him a glass-maker at St. Helens.

However different they might be in temperament, in habits of mind, and in intellectual tendencies—it is impossible to conceive, for example, two more sharply contrasted characters than James Muspratt and Peter Spence—all the men had certain gifts in common, chief among which were imagination and invention, pertinacity and resource, courage and self-reliance. Some of them, and not always the most talented, became wealthy; others, greatly daring, brought themselves to the verge of ruin in what seemed at the time heroic but hopeless struggles with the vagaries of a chemical process. These men pursued chemical manufacturing with all the keenness of scientific investigation, and wrestled with difficulties for the pure love of conquest.

Mr. Allen tells the story of their hopes and disappointments, their failures and triumphs, and tells it very well. We heartily commend his book to all who are interested in industrial progress, and in particular to chemical students who desire to know some-